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STATE DOCUMENTS

MONTANA STATE HIGHWAY COMMISSION
PLANNING SURVEY DIVISION
HELENA, MONTANA

June 15, 1957

ECONOMIC ANALYSIS OF ALTERNATE ROUTINGS OF INTERSTATE HIGHWAY NO. 101 (U.S. NO. 10) IN THE VICINITY OF LIVINGSTON, MONTANA

FOREWORD

An economic analysis of this type is prepared for the purpose of analysing the relative merit of proposed alternate highway routings. Two factors are considered in the analysis: the relative operating costs incurred by the highway users via each route; and the relative cost of constructing and maintaining each route. The route having the lowest highway-user operating costs would be the most favorable from the standpoint of the traveling public. The route having the lowest cost for construction and maintenance would be most advantageous from the standpoint of the taxpayer. In the final analysis, the preferable route would be the one having the lowest overall cost, including a combination of operating costs, construction costs and maintenance costs.

TRAFFIC

An origin-destination traffic survey was conducted in the vicinity of Livingston, during the period of July 10-17, in 1956, for the purpose of collecting traffic information necessary for the planning of highway locations. This survey was conducted during the hours of 6 a.m. to 10 p.m. Motorists using the principal highways through the city were stopped and questioned concerning the origin and destination of their trips. The trips were classified according to origin or destination within certain specified zones into which the city was divided. Under this procedure, it was possible to summarize the number of trips from each zone, trips by areas comprising several zones, and the total number of trips occurring within a normal day. The results of the survey are shown in the following:

STATION NO. 1
WEST OF LIVINGSTON, ON U. S. NO. 10

DISTRIBUTION OF TRIPS BY AREA

	NUMBER	PERCENT
NORTH OF RAILROAD TRACKS	118	5
SOUTH OF RAILROAD TRACKS	699	28
CENTRAL BUSINESS DISTRICT	696	28
THROUGH CITY WITHOUT STOPPING	966	39
TOTAL	2479	100

MONTANA STATE LIBRARY
930 East Lyndale Avenue
Helena, Montana 59601

STATION NO. 2
EAST OF LIVINGSTON, ON U. S. NO. 10

DISTRIBUTION OF TRIPS BY AREA

	NUMBER	PERCENT
NORTH OF RAILROAD TRACKS	162	6
SOUTH OF RAILROAD TRACKS	885	33
CENTRAL BUSINESS DISTRICT	698	27
THROUGH CITY WITHOUT STOPPING	900	34
TOTAL	2645	100

STATION NO. 3
SOUTHWEST OF LIVINGSTON, ON U. S. NO. 89

DISTRIBUTION OF TRIPS BY AREA

NORTH OF RAILROAD TRACKS	204	9
SOUTH OF RAILROAD TRACKS	884	38
CENTRAL BUSINESS DISTRICT	750	33
THROUGH CITY WITHOUT STOPPING	462	20
TOTAL	2300	100

ALL STATIONS

DISTRIBUTION OF TRIPS BY AREA

NORTH OF RAILROAD TRACKS	484	7
SOUTH OF RAILROAD TRACKS	2468	33
CENTRAL BUSINESS DISTRICT	2144	29
THROUGH CITY WITHOUT STOPPING	2328	31
TOTAL	7424	100

The results of this survey, as shown for all stations, disclose that 7% of the trips resulted from the zones north of the railroad tracks, 33% of the trips came from zones south of the railroad tracks (excluding the central business district), 29% of the trips occurred from the central business district, and 31% of the trips passed through the city without stopping. The distribution of trips by station and by area is presented graphically in the attached Exhibit "A". Similar information by zone, rather than area, is shown in Exhibit "B".

ALTERNATE ROUTES

After making a field reconnaissance survey and inspecting aerial photographs, the Interstate Division selected two alternate routings for the new highway which would be feasible to construct and which would meet the standards prescribed for Interstate System highways. These routes are shown on the attached Exhibits "A" and "B".

The two alternates have a section common to both routes which begins at a point on the present highway about 3.0 miles west of the junction of U. S. Highways 10 and 89 in Livingston. From the point of deviation from the present highway, the common section extends in a southeasterly direction to a point on U. S. Highway 89 about 1.1 miles south of the same junction of U. S. Highways 10 and 89 in Livingston.

Interchanges to provide ingress and egress for traffic will be located on the common section at the point of departure west of the city and at the junction with U. S. Highway 89 south of the city.

The common section continues past the junction with U. S. Highway 89 for a distance of about 0.2 mile where the two alternates diverge and follow separate locations to a common point on U. S. Highway 10 about 1.4 miles east of Livingston.

Beyond the point of divergence, the North Route follows along the north bank of the Yellowstone River on alignment which avoids, as much as possible, the developed section of the city in this area. Despite the effort to avoid developed areas, this route will seriously affect present housing, commercial and recreational features. Several houses will have to be moved, a warehouse will be demolished, a large portion of the city park will be involved, a drive-in theater and a trailer park will be obliterated, and a proposed housing area will be affected. Other detrimental effects are also very probable.

At the east edge of the city, the North Route crosses the Yellowstone River at a point just north of the present county bridge in this vicinity. It then follows a level grade along the foot of a gravel bench to a point on the present highway about 1.4 miles east of the city limits. Interchanges to serve traffic will be located at a point on the southward extension of Main Street in Livingston, and at the point of junction with the present highway east of Livingston. The total length of the North Route is 7.7 miles, including the common section of 3.2 miles in length.

After leaving the point of divergence from the common section, the South Route crosses the Yellowstone River at a nearby site and follows along the south side of the river. It extends through a relatively undeveloped area to a terminus common to the North Route on the present highway about 1.4 miles east of the city limits. The alignment of the South Route is such that the new highway will have to climb to the top of the gravel bench on the south side of the river and then descend to the level of the present highway east of the city. The grades involved will have little effect on passenger car traffic, but they will be steep enough to effect truck operations.

Because the South Route will be located on the south side of the Yellowstone River, it will not be possible to construct an intermediate interchange to provide a connection to the central part of the city, as is planned for the North Route. The South Route has a total length of 8.0 miles, including the 3.2 mile section of highway common to both routes.

On the location chosen for the South Route, there will be very little disruption of existing development. The route south of the river traverses farm land, and although some land will be required for right-of-way purposes, none of the existing buildings should be affected. The section of this route across the bench land will pass through the old airport there. It is possible that one or more of these buildings might be on the new line, but the cost of removal should be small.

HIGHWAY USER COSTS

One of the primary considerations in this analysis is the selection of the route which will be most beneficial to the highway user. The route which would produce the lowest highway user operating costs would naturally be the most beneficial from the standpoint of the traveling public using this highway.

In computing the operating costs, it was necessary to measure the trip distance from the various zones via the alternate routes to the common termini at the ends of the alternates. In delineating the routing of these trips, proper consideration was granted to the propensity of the average driver to use a modern highway facility to the maximum extent in trips involving external origins or destinations. On the other hand, it was assumed that many trips would use existing facilities for the entire trip to the external terminus for the reason that use of either of the new alternate routes would have involved much greater travel distance. For example, it may be assumed that east-bound trips, originating in the east central part of the city, would continue to use present U. S. No. 10 in traveling to the interchange east of the city. There would be no advantage to these drivers in traveling west and south to get onto either of the alternate routes at interchanges in the southwestern area.

After the travel distances had been measured from each zone via each alternate route, the distance was multiplied by the number of trips from each zone in order to determine the total vehicle miles of travel involved via each alternate. The vehicle miles of travel were then multiplied by operating cost factors which varied according to the proportional use of the new highway facilities. As a whole, the operating costs on the new facilities were established at levels about two-thirds of the cost of traveling on the more congested city streets and present U. S. Highway No. 10.

The results of these computations are shown in the following table:

COMPARISON OF HIGHWAY USER COSTS

	NORTH ROUTE	SOUTH ROUTE
ROUTE LENGTH (MILES)	7.727	8.004
ANNUAL TRIPS	2,709,760	2,709,760
AVERAGE TRIP LENGTH (MILES)	4.0958	3.6950
ANNUAL VEHICLE MILES OF TRAVEL	11,098,555	10,012,680
HIGHWAY USER COST PER TRIP	$ .4741	$ .4823
ANNUAL HIGHWAY USER COST	$1,284,666	$1,306,947

The results of these computations show that, from the standpoint of the highway user, the North Route would be preferable. It would save the traveling public about $22,000 per year in operating costs. These savings would occur for the following reasons:

1. The total length of the North Route is about 0.3 miles shorter than the South Route. This amount of distance savings would be experienced by all through trips.

2. Although the average trip length for the North Route is about 0.4 miles longer than the South Route, use of the North Route would permit a higher proportion of travel on the the new highway facilities, thereby resulting in a lower operating cost per mile. This lower cost per mile would more than offset the greater trip distance with the result that the North Route would produce a lower cost for the average of all trips.

3. As pointed out before, many of the drivers would continue to use the present highway facilities in preference to the South Route because of its inaccessibility. This would result in a shorter trip distance, as compared with the North Route, but the travel would be performed at a much greater cost per mile. The result would be a higher cost per trip and a higher overall cost for the South Route.

CONSTRUCTION AND MAINTENANCE COSTS

The following table has been prepared on the basis of cost estimates furnished by the Interstate Division:

	NORTH ROUTE	SOUTH ROUTE
TOTAL CONSTRUCTION COST	$ 4,893,940	$ 3,129,880
CONSTRUCTION COST PER MILE	633,355	391,039
ANNUAL COST INCLUDING MAINTENANCE (40 YEAR LIFE)	137,803	94,255
CONSTRUCTION AND MAINTENANCE COST PER TRIP	$ 0.0509	$ 0.0348

These figures show that the construction and maintenance costs for the South Route would be much lower than those of the North Route. From the standpoint of the taxpayer, the South Route would be preferable.

COMBINED COSTS

The following table shows the total cost for each route as obtained by combining the highway user costs with the costs for construction and maintenance:

	NORTH ROUTE	SOUTH ROUTE
HIGHWAY USER COSTS PER TRIP	$ 0.4741	$ 0.4823
CONSTRUCTION AND MAINTENANCE COSTS PER TRIP	$ 0.0509	0.0348
TOTAL COSTS PER TRIP	$ 0.5250	$ 0.5171
SAVINGS PER TRIP FOR SOUTH ROUTE		$ 0.0079
ANNUAL SAVINGS - ALL TRIPS		$ 21,407
SAVINGS OVER 40 YEAR PERIOD		$ 856,280

CONCLUSIONS

This analysis shows that the North Route would be most beneficial for the highway user; the South Route would be preferable from the standpoint of construction and maintenance costs; and the South Route would be preferable from the standpoint of the total overall cost.

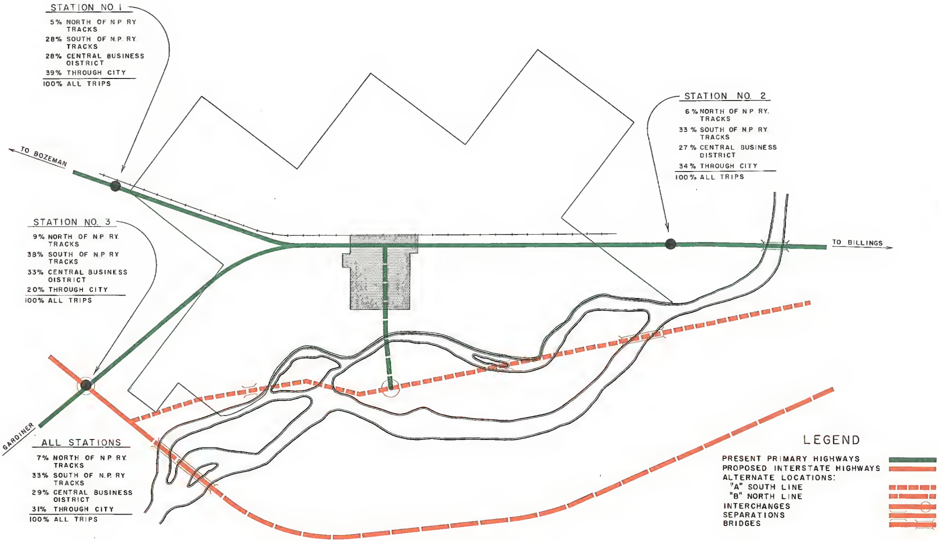
The difference of about 8 mils per trip in favor of the South Route is not sufficient to provide conclusive support for that route; however, it is felt that other factors would favor the selection of the South Route.

The North Route would involve the removal or destruction of several homes, many of which have a high valuation. It would also destroy a section of the city which shows a tendency to develop into an above standard residential area. The city water works is located in close proximity to the North Route, and it is evident that some of the water facilities would have to be altered. The North Route would also destroy the best part of the Sacajawea City Park.

These features are difficult to evaluate in monetary terms, but the absence of such disruption on the South Route would support the selection of that route when considered along with the favorable rating for the Soute Route as revealed by the comparison of highway user and construction and maintenance costs.

EXHIBIT A

DISTRIBUTION OF TRIPS BY STATIONS



STATION NO. 1

5% NORTH OF N.P. RY. TRACKS
28% SOUTH OF N.P. RY. TRACKS
28% CENTRAL BUSINESS DISTRICT
39% THROUGH CITY
100% ALL TRIPS

STATION NO. 2

6 % NORTH OF N.P. RY. TRACKS
33 % SOUTH OF N.P. RY. TRACKS
27 % CENTRAL BUSINESS DISTRICT
34 % THROUGH CITY
100 % ALL TRIPS

STATION NO. 3

9% NORTH OF N.P. RY. TRACKS
38% SOUTH OF N.P. RY. TRACKS
33% CENTRAL BUSINESS DISTRICT
20% THROUGH CITY
100% ALL TRIPS

ALL STATIONS

7% NORTH OF N.P. RY. TRACKS
33% SOUTH OF N.P. RY. TRACKS
29% CENTRAL BUSINESS DISTRICT
31% THROUGH CITY
100% ALL TRIPS

LEGEND

PRESENT PRIMARY HIGHWAYS 🟩
PROPOSED INTERSTATE HIGHWAYS 🟥
ALTERNATE LOCATIONS:
"A" SOUTH LINE
"B" NORTH LINE
INTERCHANGES
SEPARATIONS
BRIDGES

EXHIBIT B

DISTRIBUTION OF TRIPS BY ZONES